BULLETIN NO. 1

OF THE

ILLINOIS

STATE MUSEUM OF NATURAL HISTORY,

SPRINGFIELD, ILLINOIS

ARTICLE I.

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BY A. H. WORTHEN.

ARTICLE II.

ADDENDA. CORRECTIONS AND PROPOSED NEW NAMES FOR SPECIES PREVIOUSLY DESCRIBED IN THE GEOLOGICAL SURVEY OF ILLINOIS, UNDER NAMES THAT WERE PREOCCUPIED; AND DESCRIPTIONS OF TWO NEW SPECIES OF FOSSIL SHELLS FROM THE COAL MEASURES OF ILLINOIS AND KANSAS.

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BY CHARLES WACHSMUTH.

FEBRUARY, 1882.

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DESCRIPTIONS OF FIFTY-FOUR NEW SPECIES OF CRINOIDS FROM THE LOWER CARBONIFEROUS LIMESTONES AND COAL MEASURES OF ILLINOIS AND IOWA.

BY A. H. WORTHEN,
State Geologist.

For the use of a part of the crinoids described in the following pages, I am indebted to the liberality of Mr. L. A. Cox, of Keokuk, Iowa, who, by his zeal and indefatigable industry as a collector, has brought together one of the finest collections of these beautiful fossils ever obtained from the Keokuk limestone, and he has also been so fortunate as to obtain a large number of specimens from a higher horizon in the Keokuk group, than that from which most of the crinoids peculiar to this formation had previously been obtained.

In the winter of 1879, a few finely preserved crinoids were found by Mr. Cox and Mr. Anderson, of Keokuk, in loose pieces of sandy shale at the foot of the bluff about a mile below the city, which had evidently fallen down from above, and an ineffectual attempt was at once made to discover the exact horizon from which the shaly fragments had come. On a subsequent visit by Mr. and Mrs. Cox to the locality, the latter, who is also an excellent collector, succeeded in locating the exact spot from which the crinoids had come, and in finding the fossils *in situ*.

By quarrying into the bluff at the right point, some four or five hundred specimens have been obtained by different collectors who have visited the locality, all secured from a surface scarcely more than six feet square, and from a stratum only a few inches in thickness, situated near the dividing line between the geodiferous shales of the Keokuk group, and the overlying Warsaw beds.

In 1880 another discovery of fossil crinoids was made by Mr. N. K. Burket, of Keokuk, in the Keokuk limestone at Hamilton, Illinois. This was in a different geological level from that just described, and it has not afforded as large a number of specimens as the other, but many of them are remarkable for their large size and fine state of preservation. Moreover, they are generally specifically distinct from those obtained in the sandy shale, and many of the species found here are common in the Keokuk limestone at other localities. Mr. Burket and Mr. Cox worked this locality jointly, and in a surface of about 8 to 10 feet square they obtained from 175 to 200 crinoids, many of them with the arms attached. They were all obtained from a cherty layer some three or four inches in thickness, intercalated in the upper part of the Keokuk quarry-rock, some five or six feet below the base of the geodiferous shales, and some forty feet below the sandy shales that were so prolific in similar forms on the Iowa side of the river.

In describing the *Poteriocrinidæ* I shall not use the subgeneric terms hitherto proposed by various authors, for the following reasons: First, I see no beneficial result that is likely to come from cumbering the nomenclature of paleontology with such terms, and secondly, because any proposed subgeneric formula that groups together such diverse forms as *Zeacrinus maniformis*, Yandell & Shumard, and *Poteriocrinus Bisselli*, Worthen, can be of no practical advantage in the study of this group of crinoids, and hence, until some satisfactory generic characters can be pointed out, by which they may be separated, it seems advisable to include them all under the generic name originally proposed by Miller for them.

All the new species described in the following pages will be fully illustrated in the 7th Vol. of the Geol. Surv. of Illinois, now in course of preparation.

POTERIOCRINUS COXANUS. N. SP.

Body above the medium size, obconic, gradually swelling from a truncated base to the summit of the radial plates, where it is about one-fourth wider than high. Basal plates as wide, or a little wider, than high, forming by themselves a low pentagonal cup, about twice as wide as high. One subradial on the anterior side is longer than wide, the others about as wide as long, all pentagonal, there being but two distinct angles on their lower margins.

Radials nearly once and a half as wide as high on the anterior rays, curving in on their lateral borders so as to give a pentalobate character to the upper part of the body.

Brachials two, the first quadrangular, and the second pentangular, and both more than twice as wide as long, the second supporting on their sloping sides the first divisions of the rays. Only two of the rays and a part of the third, are to be seen, the others being concealed in the rock. In one of these, probably the anterior ray, a second bifurcation takes place on the fifth plate in each division, and the outer branch is seen to divide once more about the tenth plate, and the inner division on the twenty-fourth to the twenty-sixth plate, beyond which the arms of this ray are not preserved.

On the right antero-lateral ray the second bifurcation takes place on the fourth plate in each division, the outer branch dividing twice more on the eighth and twenty-second plate, and the inner one twice on the twenty-fourth to the twenty-sixth plate, beyond which they are not preserved. This gives twelve visible arms to this ray, and it is quite possible there were other divisions beyond, as the arms extended about two inches beyond the last divisions that are preserved. The arms are stout, and composed of rounded, short, nearly parallel plates, that give off delicate pinnules from their inner margins. The upper part of the ventral tube is exposed by the partial removal of the arms, showing that this organ was trumpet shaped, and crowned with heavy hexagonal plates, produced at the center into rather sharp nodes, while below, the plates are thinner, and crossed by about three sharp ridges, that are most prominent in the

center of the plate. Similar ridges are also visible on the margins of some of the summit plates. Anal plates unknown. Column round and rather stout, composed of thin, even plates. Length of body and arms $5\frac{3}{8}$ inches, breadth at the summit of the ventral tube $2\frac{3}{4}$ inches, length of column $7\frac{5}{8}$ inches.

This magnificent specimen of *Poteriocrinus*, the finest ever obtained from the Keokuk limestone, I take pleasure in dedicating to Mr. L. A. Cox, of Keokuk, Iowa, to whom it belongs, in recognition of his zeal and untiring industry in collecting the crinoids and fishes of that vicinity.

Position and locality, upper part of the Keokuk limestone, Hamilton, Ill.

Mr. L. A. Cox's collection.

POTERIOCRINUS BURKETI N. SP.

Body small, cup shaped below the summit of the first radial plates. Basals small and concealed by the first joints of the column. Subradial plates slightly protuberant from the depression of their upper angles, curving below into the basal concavity.

Radials pentagonal, about once and a half as wide as long. Brachials two to each ray, the first quadrangular, and the second the same form as the radials, and supporting on their upper, sloping sides the first divisions of the arms. The arms after the first division on the second brachial plate, divide again on the sixth to the ninth plate, beyond which they continue simple to their extremities, making four arms to each ray. Arms composed of slightly wedge-formed plates, about as long as wide below the last bifurcation, but proportionately longer and more zigzag in their arrangement above, giving off strong pinnules alternately from their longest sides. Anal plates small, the first one apparently resting between two of the subradials, and this is succeeded by a double series of minute plates that form the lower extremity of the ventral tube. This organ is composed of minute plates, is balloon shaped, and shows a small opening about two-thirds the distance from the base to the summit. Column at the top composed of round, nearly uniform plates, but a short distance below thicker joints are intercalated at irregular intervals. It decreases in diameter nearly one half in a distance of two inches from the top, and has delicate cyrrhi attached on either side at irregular intervals.

The depressions at the angles of the body plates, gives to the exterior of the cup-shaped body a somewhat rough appearance.

This species is named in honor of Mr. N. K. Burket, of Keokuk, Iowa, who discovered the interesting locality at Hamilton, where this and several other new forms have been obtained.

Position and locality: Top of the Keokuk limestone, Hamilton, Illinois.

Nos. 260 and 402 of Mr. L. A. Cox's collection.

POTERIOCRINUS TENUIDACTYLUS N. SP.

Body obconical, length and breadth to the top of the radial plates about equal. Basals well developed, expanding upward from the column, forming a pentagonal cup rather wider than long. Subradials about as wide as high, the one on the posterior side supporting in part two quadrangular anal plates, that are succeeded by a double series of smaller plates of the same form, forming the base of the ventral tube.

Radials pentagonal, wider than high. Brachials four to each of the posterior rays, three of them quadrangular and the fourth pentangular, supporting on its upper sloping sides the first divisions of the rays. The arms in the left posterior ray, after dividing on the last brachial, give off a branch from each division, about the twelfth to the twentieth plate, beyond which they are simple as far as can be seen, giving four arms to this ray.

The arms are long and slender, composed of rather long, rounded joints, slightly zigzag in their arrangement, and give off rounded pinnules from their projecting sides.

The ventral tube, of which some traces can be seen an inch above the base, appears to have been cylindrical, starting with the two long quadrangular anal plates that rest on the posterior subradial plate, the succeeding plates decreasing upward in size.

Column at its upper extremity rather large, and composed of extremely short joints, closely anchylosed together.

Position and locality: Upper part of the geode bed, one mile below Keokuk.

No. 202 of Mr. L. A. Cox's collection.

POTERIOCRINUS IOWENSIS. N. SP.

Body short, about once and a half as wide as high. Basal plates small and hidden by the first columnar joints. Subradials small, slightly protuberant at the center and depressed at the angles. Radials twice as wide as long, pentagonal, depressed on their lower lateral borders, with a tolerably well defined suture between them and the brachials.

Brachials two, the first quadrangular twice as wide as long, the second pentagonal, giving support on their sloping angles to the first divisions of the rays, and slightly protuberant at their upper angles.

Arms after the first division on the second brachial in two of the rays, the left posterior and right antero-lateral rays, divide again on the fifth to the seventh plate, beyond which they are simple as far as they have been preserved. On another ray which may be the anterior one, the first bifurcation takes place apparently on the fifth brachial, and the second one on the third plate above, as near as can be determined from the crushed condition of this ray. Anal plates unknown.

Column round, composed of rather thick joints near the body, becoming alternately thinner below.

This species is related to *Pot.* (*Scaph.*) *Gibsoni* of White, but differs from it in the number and mode of bifurcation of the arms, and also in the form and proportion of the plates composing the body.

Position and locality: Upper shales of the geode bed, one mile below Keokuk, Iowa.

No. 56 of Mr. L. A. Cox's collection.

POTERIOCRINUS HAMILTONENSIS N. SP.

Body short, forming a low, shallow cup, about twice as wide as high. Base concave, the basal plates being hidden by the first columnar joints. Subradials of nearly uniform size, four hexagonal and one heptagonal, all curving below into the basal concavity. Radials, four of them nearly twice as wide as long, pentagonal, the one on the anterior side smaller, and all indented at their lower angles to correspond with the similar indentations of the upper angles of the subradials. A somewhat gaping suture exists between the radial and brachial series. Brachials one to each ray, longer than the radials, and four of them sharply angular above for the support of the arms. On the anterior ray the brachial is constricted above to about one-half its width below, and on its upper truncated margin supports the plates of a single arm, making nine arms altogether for this species. Four or five anal plates can be seen arranged as usual in this genus. Arms composed of short quadrangular plates that give off strong pinnules, the joints of which are twice or more as long as wide. Column unknown.

This species is nearly related to the little form to which we have given the name *P. penicilliformis*, but differs from that in its more broadly cup-shaped body, shorter brachials and arm plates, and also in the pit-like depressions at the angles of the body plates. The body alone could not be easily distinguished from *Pot.* (*Scaph.*) *unicus* of Hall, while it is entirely unlike that in the number and arrangement of the arms.

Position and locality: Upper part of the Keokuk limestone, Hamilton, Ill.

No. 176 Mr. L. A. Cox's collection.

POTERIOCRINUS ORESTES N. SP.

Body depressed cup shaped, about twice as wide as high. Base concave, basals small and concealed under the first columnar joints. Subradials as wide or a little wider than high, three hexagonal and two on the posterior side heptagonal, all curving into the cavity below. Radials about twice as large as the smaller subradials, four of them pentagonal, and one on the right posterior side heptagonal, counting three angles below.

Brachials, five to the anterior ray, the first one of which is as wide below as the first radial, but constricted above to correspond with

the narrow succeeding plates, which are quadrangular and narrowly rounded on their external surfaces. The fifth brachial is angular above, a little wider than those below, and gives support on its upper sloping sides to the first divisions of the ray, which thence continue simple to their extremeties.

The four other radials have each a single brachial, which is as wide as the radial on which it rests, with a gaping suture between, all pentangular, and supporting on their sloping upper angles the first divisions of the rays.

The left antero-lateral ray, after its first bifurcation on the brachial plate, divides again on the sixth plate above, and the outer division twice more on the seventh or eighth plate, while in the right antero-lateral, both divisions bifurcate on the sixth plate, and the outer division again on the seventh or eighth plate, making five divisions to this ray, which is probably the normal number in all the rays except the anterior one, or twenty-two to the complete organism. The arms are composed of rounded, wedge-formed joints, giving off strong pinnules alternately from their longest sides—Pinnules composed of rounded joints about twice as long as wide.

Anal plates, five visible. The first one is pentagonal, and rests between the upper angles of two of the subradials, and partly under the lower angle of the right posterior radial. The second anal is larger than the first, hexagonal, and rests upon one of the subradials, and extends above the top of the left posterior radial. The third anal is hexagonal, about as large as the first, on which it rests, and it extends nearly half its length above the top of the posterior radial on the right. The fourth and fifth anals are smaller, the one resting on top of the second anal and the other on the third. Column unknown.

Position and locality: Top of the geodiferous shales of the Keokuk group, one mile below Keokuk, Iowa.

Nos. 184 and 243 of Mr. L. A. Cox's collection.

I take pleasure in dedicating this beautiful species to my worthy friend and co-laborer Mr. Orestes St. John.

POTERIOCRINUS LATIDACTYLUS. N. SP.

This interesting species is only represented by a single imperfect specimen, showing the posterior side of the body, and a part of three of the rays.

Body mamillæform, once and a half as wide as high to the top of the first radials, and composed of smooth, closely joined plates. Basals unknown. Subradials nearly as large as the radials, length and breadth about equal, four of them hexagonal counting three angles below, the left posterior one larger than those on the anterior side and heptagonal. Radials pentagonal, once and a half as wide as high, and truncated straight across their upper margins for the reception of the brachials. These are of the same form and a little larger than the radials, and support on their upper sloping sides the first divisions of the rays. The arms are composed of broad, short,

quadrangular plates, resembling closely the arms of *Woodocrinus* and *Bursacrinus*. In two of the rays which are partly preserved in the specimen before me, a second bifurcation takes place on the fourth plate above the brachials, beyond which the arm structure is unknown. The first arm-plates in the two posterior rays are about twice as long as the succeeding ones.

Three anal plates are visible; the first one is larger than the others, and rests between the upper angles of the two posterior subradials. The second rests on top of the left posterior subradial, and the third, which is smaller than either of the others, rests upon the first, and above this the lower margins of two or more succeeding plates can be seen.

Column stout, covering the entire width of the base, and composed at first of nearly equal joints that decrease in diameter below, and pass into a series of alternately thick and thinner joints as the distance from the base increases.

Position and locality: Upper part of the Keokuk limestone, Hamilton, Ill.

No. 401 of Mr. L. A. Cox's collection.

POTERIOCRINUS PENICILLIFORMIS. N. SP.

Body small, forming below the summit of the radial plates a low cup, about twice as wide as high. Basals, and the lower angle of the subradials, concealed under the first columnar joints.

Subradials about as long as wide, except the one on the posterior side, which is a little longer than the others. Radials about twice as large as the basals, wider than long, and truncated squarely across their upper margins for the reception of the brachials. Brachials twice as long as wide, four of them pentagonal, constricted in the middle, and supporting two arms which continue simple to their extremities. The anterior ray has a long quadrangular brachial plate supporting a single arm, making nine arms altogether for this species.

Arms composed of rounded joints that are generally longer than wide, but slightly wedge-shaped, giving off strong pinnules from their longest sides.

Column slightly larger at its junction with the body than below, composed of alternately thicker and thinner joints.

First anal plate longer than wide, pentagonal, and rests partly between two of the subradials and under the right posterior radial. Above this a double series of small anal plates can be seen, the first of which rests on top of the left posterior subradial, and the second on the first anal.

This little crinoid is related to that described by Meek and Worthen in the second volume of the Geol. Survey of Illinois, p. 238, pl. 17, fig. 6, under the name of *Scaphiocrinus decadatylus*, but differs from it in the proportions of the body plates, and especially in its brachials and arm plates.

Position and locality: Upper part of the Keokuk limestone, Hamilton, Illinois.

No. 269 of Mr. L. A. Cox's collection.

POTERIOCRINUS TENUIDACTYLUS. N. SP.

Body of medium size, depressed cup-shaped, more than twice as wide as high, Base depressed, basal plates small and concealed in the basal cavity. Subradials as long or longer than wide, three hexagonal and two on the anal side heptagonal.

Radials about twice as wide as long; heptagonal, and truncated squarely across their upper margins for the reception of the brachial series.

Brachials two, the first quadrangular, and the second pentangular, both as wide or a little wider than the radials; the second supporting on its upper angles the first divisions of the arms. The arms are composed of wide, short, quadrangular joints, and bifurcate the second time on the fourth and sixth plates above the brachials, beyond which they are all simple to their extremities, making four arms to each ray. Above the second bifurcation the plates of the arms gradually diminish in width, and become slightly wedge-formed, giving off strong pinnules from their longest sides.

Anal area proportionately large, with nine small anal plates visible. The first is pentagonal, and rests between two of the subradials and partly under one side of the right posterior radial. The two succeeding anals are larger, placed side by side, their lower margins resting, the left one on the truncated margin of one of the subradials, and the other between the upper angle of the first anal and the left margin of the first radial to the right. The next series of anals consists of three smaller plates placed side by side, and these are succeeded by three more that are not fully exposed.

Column unknown.

Position and locality: Upper shales of the geode bed, one mile below Keokuk, Iowa.

No. 403 of Mr. L. A. Cox's collection.

POTERIOCRINUS OCCIDENTALIS. N. SP.

Body cup shaped, about twice as wide as high. Base depressed, the basals small and hidden under the first columnar joints. Subradials hexagonal and heptagonal, the lower angle curving under to form a part of the basal concavity.

Radials pentangular, nearly twice as wide as long, with a gaping suture between them and the brachials.

Brachials on four of the rays pentangular, widest below, slightly constricted in the middle, and angular above, supporting on their sloping sides the first division of the rays. Another bifurcation takes place on the tenth plate above the brachials in these four rays,

beyond which they are simple to their extremities. The anterior brachial is quadrangular, constricted above, and supports a single arm, making 17 arms altogether for this species.

The anal side of the specimen is distorted so that the number and form of the anal plates cannot be clearly determined; but three can be seen; the second one much larger than the others, and apparently arranged as usual in this genus.

Column moderately stout, round and composed at the summit of evenly-sized plates, that alternate with thinner ones below.

This species is nearly related to *Pot.* (*Scaph.*) *unicus*, of Hall, but differs essentially from that in the number and bifurcation of the arms.

Position and locality: Upper beds of the Keokuk limestone, Hamilton, Ill.

No. 170 of Mr. L. A. Cox's collection.

POTERIOCRINUS ASPER. N. SP.

Body of medium size, basin shaped, base slightly depressed, the basal plates being concealed by the columnar joints. Subradials prominent, length and breadth about equal, the lower angles forming a part of the basal concavity, and the upper angles depressed to correspond with similar depressions in the lower margins of the radial plates.

Radials short, about as wide as long, pentagonal, depressed at their lower angles, with a gaping suture between them and the succeeding brachials.

Brachials two, the first quadrangular, the second sharply angular above, and but little narrower than the radial series. A slight angular prominence extends lengthwise across the brachial plates, and the same may be seen on the lower portion of the arms under a good glass.

Arms on the anterior ray, after the first division on the second brachial, divide again on the fourth and sixth plate, and both the outer divisions again on the eighth plate, while the inner one appears to be simple after the second division, thus giving six arms to this ray. The antero-lateral rays appear to divide once more, giving eight arms to these rays.

Arm pieces rounded, moderately wedge-shaped, and diminish rather rapidly in width towards their extremities. Delicate pinnules are given off from their longest sides. Anal plates and column unknown.

The depressions at the angles of the body plates, give a rugged appearance to the body of this species, and will serve to distinguish it from the other forms with which it is associated.

Position and locality: Upper part of the geodiferous shales of the Keokuk group, one mile below Keokuk.

No. 191, Mr. L. A. Cox's collection.

POTERIOCRINUS BRIÆRIUS. N. SP.

Body of medium size, cup shaped, base depressed; the basal plates small, not extending beyond the columnar facet. Subradials prominent in the center and depressed at the angles, three hexagonal and two on the posterior side rather larger than the others, and heptagonal.

Radials pentagonal, nearly twice as wide as long, depressed on their lower margins to correspond with the depressions in the subradial plates. They are constricted across the middle, and projecting on their upper margins, with a distinct suture between them and the brachial plates.

First brachial quadrangular, the second pentangular, sharply angular above, giving support on its upper sloping angles to the first divisions of the rays.

The arms on the three anterior rays, after their first division on the second radials, divide at least four times, and one of them, the left antero-lateral ray five times, the division in every case taking place on the outer branch, as in *Zeacrinus*, while the inner branches continue single to their extremities. The divisions generally occur on the sixth, eighth, twelfth or sixteenth plate, making ten arms to two of these rays, which is probably the normal number, and eleven to the other. On the posterior rays, these divisions take place on the fourth, sixth and eighth plates. This gives an arm formula of fifty arms, as the normal number for this species.

First anal plate hexagonal, about as large as the smallest subradials, second and third rather smaller than the first, and all arranged as usual in this genus. They are all depressed at the angles, though not quite so much as the other plates of the body. Column unknown.

Position and locality: Upper part of the geodiferous shales of the Keokuk group, one mile below Keokuk.

Nos. 100 and 185 of Mr. L. A. Cox's collection.

POTERIOCRINUS ASPERATUS. N. SP.

Body depressed, forming a low saucer-like cup below the summit of the radial plates. Base depressed, and basal plates concealed by the upper columnar joints. Subradials small, their lower angles concealed in the basal concavity.

Radials about twice as wide as long, pentagonal, without any well defined suture between them and the first brachial plates.

Brachials two, about the same size as the radials, the first quadrangular, and the second pentangular, giving support above to the first divisions of the rays.

Arms composed of rounded, nearly quadrangular joints, and after the first division on the second brachial they divide twice more in the posterior rays, first on the seventh, and each division again on

the tenth, plate, making eight arms to each of these rays. The other rays are partially embedded in the matrix. minute projections are visible, with a good glass, on the outer side of the arm plates, that give a roughened aspect to the whole specimen, and has suggested the specific name, and will also serve to distinguish it from nearly related species.

Anal plates so closely anchylosed that their forms cannot be clearly determined, but the first one rests between two of the subradials, and is succeeded by a double series of smaller plates that apparently go to form the base of the ventral tube. Traces of coarse striæ, or rows of granules, extending across the brachial plates, as well as the radials, can be seen with a good glass.

Column round, composed of rather even joints, with numerous delicate cirrhi attached to it at short intervals.

Position and locality: Upper part of the geodiferous shales of the Keokuk group; one mile below Keokuk.

No. 234 of Mr. L. A. Cox's collection.

POTERIOCRINUS ARACHNÆFORMIS. N. SP.

Body small, obconical, length and breadth about equal, gradually swelling from the base to the summit of the radial series. Basals projecting more than half their length beyond the column, and forming by themselves a low, pentagonal cup. Subradials comparatively large, three hexagonal, and two heptagonal. Radials smaller than the subradials, the articulating scar semi-circular, and occupying only about half the width of the plate, with a projecting rim around its outer margin.

Only one anal plate is preserved in the specimen under description, which is about half as large as the largest of the subradials between which it rests, and it extends up to the summit of the right posterior radial. The left posterior subradial is truncated at the summit for the support of the second anal, which is not preserved.

Only one of the rays is partially preserved. In this there are five brachials, the last one of which is an axillary plate, and supports the first divisions of the ray, one of which divides again on the third plate, beyond which the arms are not preserved. The arms are composed of long, slender, rounded joints, generally twice as long as wide.

Column unknown.

Position and locality: Keokuk limestone, Warsaw, Ill.

Illinois State collection.

POTERIOCRINUS NAUVOOENSIS. N. SP.

Body small, cup-shaped, the plates being displaced somewhat by crushing, prevents a complete diagnosis.

Basals small, and hidden by the first columnar joints. Subradials as high or higher than wide, and sharply angular above. Radials

pentagonal, wider than long. First brachial quadrangular, second brachial pentagonal, and both as wide or a little wider than the radials below.

The arms of only one of the rays, the left antero-lateral, is preserved so that its structure can be made out. This ray divides on the second brachial, and the left branch twice more on the sixth and eighth plate above, while the right branch divides at least four times on the sixth and eighth plates, making at least eight arms to this ray. Anal series cannot be seen clearly enough to be fully determined, they are apparently arranged as usual in this genus.

Column round, and composed of thin, unequal joints.

This species is evidently nearly related to Hall's *Pot. (Scaph) æqualis*, but differs from that in the relative size of its subradial plates, and in the number and mode of bifurcation of the arms.

Position and locality: Keokuk limestone, Nauvoo, Ill.

Illinois State collection.

POTERIOCRINUS OTTERENSIS. N. SP.

Body above the medium size, basin-shaped, about once and a half as wide as high, base depressed and the basal plates hidden by the column, which is quite stout and pentalobate where it joins the body.

Subradials about one-fourth wider than long, the lower angle curving inward to form a part of the basal concavity. The center of these plates is smooth and a little protuberant, with four deep indentations on their borders, two of which are lateral, to meet those of the adjacent subradials, and two directed obliquely upward to meet similar depressions in the radial plates.

Radials wider than long, constricted across the middle, and projecting on their upper margins, with two slightly oblique depressions below, that meet two of those in the subradial plates. They are pentagonal in form and support on their upper truncated margins the brachial series.

Brachials one to each of the postero-lateral rays, smaller than the radials, slightly constricted, and sharply angular above, giving support to the first divisions of the rays. Arm structure unknown.

Three anal plates are visible, the first nearly as large as the subradials, the others a little smaller, and all having from four to six depressions around their borders that correspond to similar depressions on adjacent plates. The anal plates have been shoved out of their true position by the crushing of the specimen, so that their relation to the adjacent plates cannot be clearly determined.

Position and locality: This unique form was obtained from the Keokuk limestone, on Otter Creek, Jersey county, Ill.

Illinois State collection.

POTERIOCRINUS SUBRAMULOSUS. N. SP.

Body turbinate or obconical, higher than wide to the top of the radial series, and composed of very thin, smooth plates. Basals

truncate below, about as high as wide, and forming by themselves a small pantagonal cup a little more than half as high as wide.

Subradials about twice as large as the basals, four of them hexagonal, and two on the posterior side larger than the others and heptagonal. Only two of the rays are preserved in the specimen before me, and in one of these, the right posterior one, the radial plate appears to be quadrangular, and rests directly upon the upper margin of the large posterior subradial below. In the left antero-lateral ray the radial is pentangular, its lower angle fitting in between two of the subradials, as is usually the case in this genus.

Brachials two, the first quadrangular, and the second pentangular, both wider than long, and the last supporting on its sloping sides the first divisions of the rays. The arms in the right posterior ray divide again two or three times, first on the seventh plate, and the outer branch twice more on the eighth and twentieth plate, and the inner division at least once more about the twentieth plate, making as many as ten arms to this ray. The left antero-lateral ray, after its first division on the last brachial plate, gives off branches in each division on the eighth plate, the outer division dividing twice more on the eighth and twenty-second plate, and the inner division once more on the twenty-second plate, which is as far as the arms can be traced. There are at least ten arms each to these two rays, and possibly more. The anterior ray is but partially exposed, and seems to have an axillary plate about the twelfth series above the last brachial. The first anal plate is nearly as large as the smallest subradial, and rests between two of them, and a smaller second anal rests upon the first, above which a double series of small plates may be seen that probably form the base of a ventral tube. Column rather stout, the first plates covering the whole diameter of the truncated base.

This species is closely related to *Pot. concinnus*, of Meek and Worthen, Geol. Surv. of Ill., Vol. 5, page 490, pl. 14, fig. 3, but differs from that in its more elongate body, the very thin plates of which it is composed, as well as in the number and mode of bifurcation of the arms.

Position and locality: Keokuk limestone, Keokuk, Iowa.

Collection of the author.

POTERIOCRINUS RICHFIELDENSIS. N. SP.

Body small, turbinate, length and breadth about equal. Basals moderately large in proportion to the entire body, projecting above the columnar facet so as to form a shallow pentagonal cup.

Subradials larger than the basals, the two on the posterior side the longest, and hexagonal.

Radials wider than long, pentagonal, with a well defined and rather gaping suture between them and the succeeding brachials. In the right posterior ray the brachial is twice as long as wide, pentagonal,

supporting on its upper sloping sides the first divisions of the ray. In the left posterior ray the brachial is divided, making two brachials in this ray, the first quadrangular, and the second short and pentangular, but I am inclined to regard this as accidental, and to believe that one brachial to each ray is the normal number.

The first anal plate is a little longer than wide, hexagonal, and rests between the sloping sides of the two posterior subradials, and partly under the left side of the right posterior radial. The second anal is a little larger than the first, and rests on the upper margin of the left posterior subradial. The third anal is smaller than the others, and rests upon the first.

Arms composed of rounded joints, not wedge-shaped, and divide the second time on the eighth plate above the brachials, beyond which they are simple in the posterior rays, the only ones visible in our specimen.

Column round, composed of short joints, and rather thicker at the base of the calyx than below.

Position and locality: Shaly sandstones of the Kinderhook group, near Richfield, Ohio.

Illinois State collection.

POTERIOCRINUS CLYTIS, N. SP.

Body small, obconical, length and breadth at the top of the radial plates about equal. Base truncated, the basal plates forming by themselves a low pentagonal cup. Subradials about as wide as high. Radials pentagonal length and width apparently about equal, and support on their upper margins a single series of long slender arm plates, making but five arms to the entire animal.

The first arm plates on the two rays that are shown in the specimen before me, are three or four times as long as wide, and above these a series of ten or twelve shorter plates are preserved, all rounded externally and generally longer than wide. The anal plates are only partially preserved, but the form of the first can be clearly seen. It is pentangular, and rests between two subradials, and under the right posterior radial. Above this, part of a short cylindrical ventral tube is preserved. Remains of short delicate pinnules can be seen, attached to the inner borders of some of the arm plates.

Column rather stout, thicker at its junction with the body than below, and composed of short even joints that alternate with thicker ones below.

This species differs in its arm formula from all other *Poteriocrinidæ* known at this time, and its departure from the normal structure may prove of generic importance.

Position and locality: St. Louis limestone, Monroe county, Ill.

Illinois State collection.

POTERIOCRINUS FOUNTAINENSIS. N. SP.

Body under medium size, rapidly spreading from the base to the top of the radial series, where it is about twice as wide as high. Basals small and concealed by the first columnar joints. Subradials hexagonal and heptagonal, length and breadth about equal. Radials once and a half as wide as long, pentagonal, with a well defined suture between them and the brachial plates. Brachials about twice as long as wide. pentagonal, and narrower in the middle than at the ends and supporting two arms on their upper sloping sides, the brachial on the anterior ray being longer and more constricted than the others. Arms apparently but two to the ray, and composed of long zigzag joints, constricted in the middle and giving off on alternate sides from their upper angles strong pinnules, that are about half as large in diamater as the arms.

The first anal plate is nearly quadrangular in form, and rests between two of the subradials and under the left side of the right posterior radial. The second and third are a little smaller than the first, and above these there is a double series of small plates that extend up to the base of the ventral tube.

This species is rather closely related to *Pot. (Scaph.) internodius* of Hall, Iowa Report, part 2, but differs from that in the form and proportions of the plates of the body, and in the zigzag arrangement of the arms.

Position and locality: St. Louis limestone, Fountain creek, Monroe county, Ill.

Illinois State collection.

POTERIOCRINUS TALBOTI. N. SP.

Body very short, basin shaped, base depressed, and the basals hidden in the basal concavity.

Subradials short, curving inward below to form by their lower angles part of the basal depression.

Radials pantagonal, twice as wide as high, widest at their upper margins, and truncated squarely across for the reception of the brachial plates.

On the anterior ray there are six or seven brachials, all becoming narrower upward so that the last is only about half as wide as the first. The last one is an axillary plate, and supports two arms that continue simple to their extremities. The other rays have but a single brachial, which is as large or larger than the radials on which they rest, pentagonal in form, and give support on their upper sloping sides to the first divisions of the rays. On the left anterolateral ray the arms divide on the sixth plate, beyond which they

NOTE.—The *Scaphiocrinus decabrachiatus*, *S. internodius*, *S. scoparius* and *Zeacrinus intermedius*, described by Hall in the Iowa Report, part 2, were collected by the writer, and were all from the St. Louis limestone and not from the Chester group, a fact that it is necessary to bear in mind in the identification of these species with those from other localities.

appear to be simple, which would give four arms to this ray. If the posterior rays, which are concealed in the rock in our specimen, correspond with the antero-lateral ray, it would give eighteen arms to the entire animal. Anal area and column unknown.

I take pleasure in dedicating this species to my esteemed friend, Henry Talbot, Esq., of Waterloo, to whom I am indebted for many acts of personal kindness, and for some interesting fossils.

Position and locality: St. Louis limestone, Monroe county, Ill.

Illinois State collection.

POTERIOCRINUS VALIDUS. N. SP.

Body more than twice as wide as high, forming a low shallow cup. Basals small and concealed by the first columnar joints. Subradials hexagonal on the anterior side, strongly protuberant in the middle and depressed at the angles, giving a very rugged appearance to the outer surface of the body. Radials pentagonal, about twice as wide as long, depressed at their lower angles to correspond with the depressions of the subradial plates.

Brachials two, the first quadrangular, and the second pentangular, supporting on their upper sloping sides the first divisions of the rays. All the plates to the top of the second brachials, possess the rugged character mentioned above. Anal series unknown. Arms not preserved on the anterior ray, but from the partial preservation of those on the posterior side, there seem to be not more than two to each ray. Column round and rather delicate, composed near the body of joints of unequal size.

Position and locality: Warsaw beds of the St. Louis group, Warsaw, Ill.

Illinois State collection.

POTERIOCRINUS CLAYTONENSIS. N. SP.

Body of medium size, basin shaped, about once and a half as wide as high to the top of the radial series.

Basals small and entirely concealed in the basal concavity by the first columnar joints. Subradials nearly or quite as long as wide, their lower angles curving into the basal concavity.

Radials once and a half as wide as long pentagonal, and truncated squarely across the upper margins for the reception of the brachial series.

Brachials on three of the rays about the same size and form as the radials, and give support on their upper sloping sides to the first divisions of the rays.

The arrangement and number of the arms cannot be determined from the specimen in hand, but in the right antero-lateral ray a bifurcation takes place on the sixth plate above the brachial, beyond which the divisions are unknown. The arms are composed of wide short quadrangular plates, as in *Zeacrinus*, and would be closely joined when folded as in that genus. Three anal plates are pre-

served in the specimen under examination, the first one pentagonal, resting between two of the subradials, and partly under the sloping side of the right posterior radial, the second and third are smaller, one resting on the top of the left posterior subradial, and the other on the first anal.

Column rather stout, the upper joints filling nearly the whole concavity of the base, and composed of thick and thinner joints alternately arranged.

Position and locality: Warsaw beds of the St. Louis group, near Clayton, Adams County, Ill.

Illinois State collection.

POTERIOCRINUS ILLINOIENSIS. N. SP.

Body of medium size, obconical, gradually tapering from the summit of the radials to the base.

Basal plates of moderate size, projecting more than half their length beyond the column, and forming by themselves a low pentagonal cup.

Subradials as large or larger than the radials, two on the posterior side heptagonal, the others hexagonal.

Radials rather wider than long, pentagonal, and truncated squarely across their upper margins for the reception of the brachial series.

Brachials rather smaller than the radials, pentagonal, a little constricted above, the upper angle obtuse, and giving support to the first divisions of the rays. The arms are not preserved in the only specimen yet found of this species, but from the very narrow plates that are to be seen in one of the rays, they probably continue simple above the first division on the brachial series.

First anal plate longer than wide, pentagonal, and resting between two of the subradials, and partly under the right posterior radial. Second anal larger than the first, hexagonal, and resting on the summit of the left posterior subradial, third anal smaller than the first on which it rests, and above this a double series of small plates are partly visible, that probably formed the base of the ventral tube.

Column round, and near the base composed of joints nearly equal in thickness.

Position and locality: Warsaw beds of the St. Louis group, Warsaw, Ill.

Illinois State collection.

POTERIOCRINUS VARSOUVIENSIS. N. SP.

Body below the medium size, basin-shaped, a little more than twice as wide as high to the top of the radial series.

Base depressed, the basal plates and the lower angles of the subradials forming the basal depression.

Subradials on the anterior side hexagonal, sharply angular above, and extending up about half the length of the radial plates.

Radials pentagonal, wider than high, the articulating scar occupying the entire width of the plate, with a well defined suture between the radial and brachial series.

Brachials two to the ray on the anterior side, the first quadrangular, and the second pentagonal, sharply angular above, and supporting on its sloping sides the first divisions of the rays. On two of the rays the arms bifurcate again on the sixth plate above the brachial series, beyond which they are unknown. All the plates of the body are finely rugose. Anal series unknown.

Column slightly pentagonal where it joins the body, and composed of alternate thin and thicker joints, but below more massive joints are intercalated at short intervals.

Position and locality: Warsaw beds of the St. Louis group, Warsaw, Ill.

Illinois State collection.

POTERIOCRINUS SPINOBRACHIATUS. N. SP.

Body of medium size, basin-shaped, about twice as wide as high to the top of the radial series. Base slightly depressed, the under basals small and concealed by the first columnar joints.

Subradials about as wide as high, the lower angles curved inward, forming a part of the basal concavity.

Radials about one-fourth wider than long, pentagonal, the upper margins concave, leaving a gaping suture between them and the brachial plates.

Brachials pentagonal, about as long as the radials, compressed laterally, so as to form a rather prominent ridge across the middle of the plate, ending at the upper angle in a rather obtuse point. All the body plates, including the second radials, are marked with rugose striations directed from above downward to the base, giving a rugose appearance to the surface of the body. The brachials are sharply angular above, and support the first arm plates, which are triangular, and one on each brachial is produced in front into a little node that covers the projection at the summit of the brachial plates. The succeeding arm plates are short, wedge-shaped, except the axillary plates, which are longer than wide, and produced outwardly into an obtuse point. All the other plates of the arms, where well preserved, show short spiniferous nodes on their outer margins.

The arms, after their first division on the brachials, divide again on the eighth or tenth plate, and the outer division once or twice more on the sixteenth to the twentieth plate, while the inner branches continue single to their extremities.

Column round, and near the top composed of short plates, the alternate ones projecting beyond the others.

Anal plates unknown.

This species is evidently related to the crinoid figured by Yandell and Shumard, in their "Contributions to the Geology of Kentucky," without a description, but if their figure is correct, our species dif-

fers from their "*Cyathocrinus florealis*," in the form and relative proportion of the body plates, as well as in the bifurcations of the arms.

Position and locality: Chester limestone, Monroe county, Ill.

Illinois State collection.

POTERIOCRINUS SALTERI. N. SP.

Body small, basin-shaped, rather more than twice as wide as high. Base depressed, and basal plates concealed in its concavity.

Subradials about as long as wide, those on the anterior side hexagonal, the lower angles curving into the basal depression, protuberant, and slightly depressed at their upper angles.

Radials pentangular, about once and a half as wide as long, slightly depressed at their sides and lower angles, and showing a distinct suture above, where they join the brachial plates.

Brachials two to the anterior ray, the first one of which is quadrangular, and wider than high. The second is pentagonal, longer than wide, its upper angle produced into an obtuse node, and supporting on its upper sloping sides the first divisions of the arms. The two antero-lateral rays have a single brachial, about the same size and form of the second brachial on the anterior ray, and support on their upper sides the first divisions of the rays.

The arms are composed of rounded, quadrangular joints, and all divide again on the sixth plate above the brachials, which is nodose like the brachials, and beyond this they appear to be single to their extremities, giving four arms to each ray. Pinnules rather strong, and are given off on alternate sides from the upper margins of the arm plates. Anal plates unknown.

Column round, composed near the body of thick and thinner joints alternately arranged.

Position and locality: Chester limestone, Chester, Ill.

Illinois State collection.

I take pleasure in dedicating this pretty species to Mrs. J. C. Salter, of Chester, in recognition of her enthusiastic labors in collecting the fosils of that very interesting locality.

POTERIOCRINUS SCULPTUS. N. SP.

Body of medium size, basin shaped, about twice as wide as high to the top of the radial series.

Base depressed, and the basals nearly concealed by the upper joints of a large pentalobate column, composed of thin plates with crenulated margins. The outer angles of the basals are barely visible in the pentalobate depressions of the column. The column decreases rather rapidly in size below its junction with the body.

Subradials a little wider than high, the two posterior plates a little larger than the others, and all crossed by two or three rounded ridges that culminate in the center of the plate in a sharp node.

Radials pentagonal, nearly twice as wide as high, with a sharp node in the center corresponding with those on the subradials, with distinct ridges extending obliquely from the nodes to meet those on the subradial plates.

Brachials two, the first quadrangular, half as long as wide; the second pentagonal, about as long as wide, and sharply angular above, supporting on its upper sloping sides the first arm plates, which are only preserved to the seventh plate above the last brachial in our specimen. The brachials and the arm plates as far as they are preserved are spine bearing.

Two anals are preserved, the first is about half as large as the large subradials between which it rests, the second is smaller and rests on the truncated upper margin of the left posterior subradial, and both ornamented like the subradials.

This species is apparently related to Z. *Stimpsoni* of S. S. Lyon, but differs conspicuously from that, in the number of its brachials, as well as in minor details.

Position and locality: Chester limestone, Monroe County, Ill. Illinois State collection.

POTERIOCRINUS COLUMBIENSIS. N. SP.

Body small, turbinate, rapidly spreading from the base to the summit of the radial plates.

Basal plates small, projecting about half their length beyond the column. Sub-radials about as high as wide, three hexagonal, and two on the posterior side a little larger and heptagonal.

Radials pentagonal, a little wider than long, except the one on the right posterior ray, which is narrower and nearly quadrangular. Brachials about twice as wide as long, rounded and constricted in the middle, pentagonal, supporting on their upper sloping sides two arms that continue single to their extremities.

Arms composed at their base of long, rounded joints, twice as long as wide, but decreasing in length above, the joints projecting laterally for the support of strong pinnules which are given off from each plate on alternate sides. Arm plates slightly cuneate in form, and the lateral projections give a zigzag appearance to the arms. Pinnules composed of round joints that are twice as long as wide where they join the arms.

The first anal is rather smaller than the second, and rests between two of the subradials and against the right posterior radial, and extends to the summit of that plate. The second radial rests on the upper margin of the left posterior subradial, and the third, which is smaller than the first, rests upon it, and extends up to the middle of the brachial on the right.

Column round, but only a few joints are attached to the specimen.

This species is closely allied to *Pot.* (*Scaph.*) *internodius* of Hall, but differs from that in the form of its radials, but more especially in its long zigzag arms.

Position and locality. Chester limestone, near Columbia, Monroe county, Ill.

Illinois State Collection.

POTERIOCRINUS SIMILIS. N. SP.

Body small, basin-shaped, twice as wide as high to the top of the radial series. The plates of the body are all slightly protuberant in the center, and depressed at the angles.

Base slightly depressed and basals concealed by the first columnar joints.

Subradials about as wide as high, hexagonal and heptagonal.

Radials wider than high, with a well-defined suture between them and the brachials. Brachials on the two posterior rays, nearly three times as long as wide, constricted in the middle and angular above, supporting on their sloping sides the two divisions of the rays. In the right antero-lateral ray, the brachial is only about twice as wide as high, its upper angle projecting so as to form a short node.

Arms two to each ray on the three rays visible, composed of rounded joints, that, at first, are nearly twice as long as wide, but they gradually become shorter above. They all project laterally, and support strong pinnules, that are given off alternately from the longest side of the arm joints. The lateral projections of the joints give a zigzag arrangement to the arms.

Only one anal plate is visible in the specimen, and this is placed, as is usual in this genus, between two of the subradials, and under the left side of the right posterior radial.

Column round, and at its upper extremity composed of joints of nearly equal thickness.

This little crinoid is related to *Pot. Columbiensis*, from the same locality, but differs from that in its more depressed base, and in the slightly protuberant character of its body plates.

Position and locality: Chester limestone, Monroe county, Ill.

Illinois State collection.

POTERIOCRINUS POPENSIS. N. SP.

Body small, obconic, gradually swelling from the base to the summit of the radial plates, where it is about once and a half as wide as long, composed of smooth, slightly protuberant plates. The basals project about one-half their length beyond the column, and form a low pentagonal cup.

Subradials on the anterior side hexagonal, about as wide as long. Radials pentagonal, once and a half as wide as long, and truncated squarely across their upper margins for the reception of the brachial plates.

Brachials pentagonal, length and breadth about equal, rounded externally, and sharply angular above, supporting on their sloping sides the first divisions of the rays. All the arms on the anterior side divide again on the seventh, eighth or ninth plate above the

brachials, and one of them gives off a second branch on the eighth plate, while the others are not preserved beyond the second division above the brachials. The arms are composed of short wide plates, the two first above the brachials being about twice as long as the succeeding ones, and all a little wedge shaped. The arms are only about half as wide above the second bifurcation as below. Anal plates unknown.

Column round, composed near the base of thick and thinner plates alternately arranged.

This species is related to *Pot. (Scaph.) Randolphensis* Geol. Surv. of Ill., Vol. 5, page 551, but differs in its wider and more nearly parallel arm plates, as well as in the bifurcation of the arms.

Position and locality: Chester limestone, Pope county, Ill.

Illinois State collection.

POTERIOCRINUS OKAWENSIS. N. SP.

Body of medium size, wider than high to the top of the radial series, composed of smooth slightly convex plates.

Base truncated, the basal plates extending above and beyond the columnar facet, so as to form a low pentagonal cup. Subradials about as long as wide, three of them hexagonal, and two on the posterior side larger than the others and heptagonal.

Radials nearly or quite twice as wide as long, pentagonal, and truncated squarely across the entire length of their upper margins for the reception of the brachial plates.

Brachials one to the ray on the two rays visible, about the same size as the radials, supporting on their upper sloping sides the first divisions of the rays.

The arms are composed throughout of short, wide, quadrangular plates, and after the first division on the radials, divide again in the left posterior ray on the ninth or tenth plate, and on the right antero-lateral, on the seventh and eleventh plate, beyond which they are simple as far as can be seen, making four arms to each of these rays.

The anal side of the specimen is distorted, but six small anal plates are partially exposed, arranged in two rows.

This species is related to *Pot. (Scaph.) Randolphensis* from the same horizon, but differs essentially from that, in the mode of bifurcation, and the wide, short plates of the arms.

Position and locality: Chester limestone, bluffs of the Okaw river above Chester, Randolph County, Ill.

Illinois State collection.

POTERIOCRINUS VENUSTUS. N. SP.

Body small, obconical, gradually swelling from the base to the top of the radial plates, where it is about once and a half as wide as long.

Basals extending about half their length above the first columnar joints forming a low pentagonal cup.

Subradials nearly equal in size, three hexagonal, and two on the posterior side heptagonal.

Radials four, a little wider than long, the right posterior one rather narrower than the others, and all pentagonal.

Brachials one to each ray, nearly as wide below as the radials, constricted above, about once and a half as long as their greatest width, sharply angular above, and supporting on their sloping sides the first divisions of the arms.

Arms composed of rounded joints, the first nearly twice as long as wide, scarcely wedge-shaped below the second bifurcation, and dividing the second time on the ninth plate above the brachials, beyond which they continue simple, making four arms to the ray. Rather stout pinnules are given off from the longest side of the arm joints on alternate sides.

The first anal plate is rather more than half the size of the subradials, pentagonal, and rests between two of the posterior subradials, and under the lower side of the right posterior radial plate. The second and third are smaller than the first, the second resting partly on the summit of the left subradial, and the third on the summit of the first anal. Column unknown.

Position and locality: Chester limestone, Monroe county, Ill.

Illinois State collection.

POTERIOCRINUS CLYTIS. N. SP.

Body below the medium size, obconic, the basals being broken away from the specimen, its relative proportions cannot be exactly determined. Fragments of two of the basals that still remain attached show that they extended beyond and above the columnar facet.

Subradials about as high as wide, three of them hexagonal, and two heptagonal.

Radials pentagonal, somewhat irregular in size, the left posterior and the left antero-lateral ones being a little larger than the others, and all about once and a half as wide as long.

Brachials one to the ray, that on the anterior ray rather the longest, the others about as long as wide, constricted in the middle, and sharply angular above, supporting on their sloping upper sides the first arm plates.

The arms, after their first division on the brachials, divide again at unequal distances from the sixth to the tenth plate above the brachials on four of the rays visible in the specimen under examination, beyond which they continue simple to their extremities, making four arms to each ray. The arm joints are all slightly wedge-formed, and quite short above the second division, and support strong pinnules, which are given off from the longest sides of the joints.

The anal side presents an anomalous feature that I have not observed in any other species of *Poteriocrinus*. In addition to the ordinary anals placed as is usual in this genus, there is a pentagonal plate about as long as the radials, intercalated between the right posterior radial and the subradial below, elevating the lower angle of this radial to a level with the summit of the other radial plates. This may only be an abnormal development, and I was at first inclined to regard this as only a variety of *P. venustus*, but its shorter brachials and arm-plates, and different mode of bifurcation of the arms, seems to afford good grounds for considering it as a distinct species.

Position and locality: Chester limestone, Monroe county, Ill. Illinois State collection.

POTERIOCRINUS PROPINQUUS. N. SP.

Body below medium size, obconic or bell-shaped, spreading rather rapidly from its truncated base to the summit of the radial plates, where it is nearly twice as wide as high.

Basals about half as long as wide above their junction with the column, forming a shallow, pentagonal cup.

Subradials on the anterior side hexagonal, length and breadth about equal, their upper angles extending up about half the length of the radial plates. Radials one-fourth to one-third wider than high, pentagonal, with their upper margins squarely truncated for the reception of the brachial plates.

Brachials widest at their lower margins, not quite as long as wide, constricted in the middle, and sharply angular above, where they support the first divisions of the rays. Arms four to eight to the ray, so far as can be seen from the specimen under examination. The left posterior ray divides the second time on the eighth or ninth plate above the brachial, beyond which the arms appear to be simple to their extremities. The right antero-lateral arm bifurcates the second time on the eighth or ninth plate, the right branch sending off two additional arms on the seventh, and again on the fourteenth plate, while the left branch gives off another arm on the eighth or ninth plate, beyond which it is not preserved. There are probably eight arms to this ray. The other rays are not preserved beyond the second bifurcation. The arms are composed of rather short, wedge-formed joints, that give off strong pinnules from their longest sides.

Anal area unknown. Column round, composed at first of rather even joints, with a thicker one intercalated at short intervals below. The calyx of this species could not be readily distinguished from several others that are found in the Chester limestone, but its long, slender arms, and their mode of bifurcation, are its distinctive characters.

Position and locality: Chester limestone, Monroe county, Ill. Illinois State collection.

POTERIOCRINUS KASKASKIENSIS. N. SP.

Body small, bell-shaped, nearly twice as wide as long to the summit of the radials, composed of rather thin, smooth plates, so closely anchylosed together that their relative size and form cannot be determined. The radials are nearly as long as wide, pentagonal, thickened on their upper margins with a lip-like suture between them and the first brachial plates.

Brachials two, the first quadrangular, the second pentagonal; length and breadth about equal, both rounded externally, and constricted, the second sharply angular above, and supporting on its sloping sides the first divisions of the rays.

Arms composed of rather long, wedge-shaped joints, that project slightly on their outer margins, giving them a somewhat zigzag appearance, and after their first division on the second brachials they all divide again on the eighth to the tenth plate above the brachials, giving four arms to each ray as the normal number. In one of our specimens, however, one arm gives off a branch near its extremity, making five arms to that ray.

Pinnules rather strong and attached to the longest sides of the arm plates. Anal plates unknown. Ventral tube cylindrical, and about twice the diameter of the adjacent arms.

Column round, composed of short, even joints, with numerous cirrhi attached at short intervals on opposite sides, which are composed of rounded joints about half the diameter of those composing the column.

This species may be readily distinguished from *P. venustus* and *P. clytis*, by the bell-shaped form of its body and zigzag arrangement of the arms.

Position and locality: Chester limestone, bluffs of the Kaskaskia river, four miles above Chester, Ill.

Illinois State collection.

ZEACRINUS COXANUS. N. SP.

Body of medium size, basin shaped, more than twice as wide as high to the top of the radial series. Base depressed, and the basals which are small, are concealed by the first columnar joints. Subradials hexagonal, once and a half as wide as their hight above the basal concavity, which is in part formed by the upward curvature of their lower angles, their upper angles extending up nearly one half the length of the radial series.

Radials nearly twice as wide as long, pentagonal, and truncated squarely across their upper margins for the support of the brachial series. The anterior ray has two brachials, the first one quadrangular, once and a half as wide as long, and the second short, pentangular, and supporting the first divisions of the ray. Each division of this ray bifurcates again on the fourteenth or sixteenth plate, the outer division, dividing again about the same distance above, making six arms to this ray.

The other rays, so far as can be seen from the only specimen we have seen, have only a single brachial plate, which is a little longer than the radial below, pentagonal, and supports on its upper angles two stout arms, which divide first on the sixth or seventh plate, the inner division continuing simple to its extremity, while the outer one divides twice more on the tenth to the twelfth plate, making eight arms to each of these rays, or thirty-eight to the entire individual.

Arms composed of short quadrangular joints, rounded exteriorly, giving off rather delicate pinnules from their inner margins. Anal series unknown. Column rather slender, composed of round plates, arranged in alternate series of thick and thinner joints. This beautiful species, the first discovered in the Keokuk limestone in Illinois, I take pleasure in dedicating to its discoverer, Mr. L. A. Cox, of Keokuk, to whom I am indebted for the use of the typical specimen.

Position and locality: Upper beds of the Keokuk limestone, Hamilton, Ills.

No. 400 of Mr. Cox's collection.

ZEACRINUS KEOKUK. N. SP.

Body of medium size, shallow basin-shaped, about twice as wide as high. Base depressed and basal plates concealed by the first columnar joints.

Subradials on the anterior side hexagonal, curving below into the basal concavity, their upper angles extending up about half the length of the radial plates.

Radials pentagonal nearly once and a half as wide as long. Brachials single on four of the rays, pentagonal, a little larger than the radial below, and supporting above the first divisions of the rays. The anterior ray has four brachials, the first as long as both the succeeding ones, quadrangular and as wide below as the radial on which it rests. The two succeeding brachial plates are short and quadrangular, a little narrower than the first. The fourth is also short subtriangular, supporting above the first divisions of this ray. Both branches of the anterior ray divide again on the tenth plate, and the outer division the second time on the tenth plate above, making six arms to this ray. One of the antero-lateral rays after its first division on the brachial plate, sends off an arm from each division on the sixth plate, the outer branches dividing again on the eighth to the tenth plate, making eight arms to this ray. The arm plates are but slightly rounded exteriorly, and nearly quadrangular in form. Anal plates unknown.

Column round, and composed near the body of rather thick, alternating with very thin, plates.

Position and locality: Upper part of the geodiferous shales of the Keokuk group, one mile below Keokuk.

No. 217 of Mr. L. A. Cox's collection.

ZEACRINUS PIKENSIS. N. SP.

Body of medium size, short, forming below the summit of the radial series a shallow cup, about three times as wide as high. Basals small and entirely concealed in the basal concavity. Subradials rather longer than wide, and curving below so as to form a part of the concavity of the base.

Radials pentagonal, once and a half, and the anterior one probably twice as wide as long, and truncated squarely across their upper margins for the reception of the brachial series.

The anterior ray has three brachials, the first one of which is as large as the radial below, the second one very short and both quadrangular; the third is also short but pentangular, supporting on its sloping sides the first divisions of the ray. One of these divisions bifurcates again on the eighth plate, and the other on the tenth, beyond which they appear to be simple to their extremities, making but four arms to this ray. The right antero-lateral ray and the left posterior ray have each a single brachial, which is nearly as long as wide, supporting on its sloping angles the first divisions of the rays. The two divisions of the right antero-lateral ray divide again on the sixth plate, and at least one of these divisions, and probably both the outer ones divide again on the tenth plate, making six arms to this ray. If the other rays correspond with this, it would give twenty-eight arms as the full series for this species. Anal plates unknown. Column slender, and composed of round joints of unequal thickness.

Position and locality: Lower part of the Burlington limestone, Montezuma, Pike County, Ill.

Illinois State collection.

RHODOCRINUS COXANUS. N. SP.

Body of medium size, subglobose, base slightly depressed, the basal plates concealed by the first columnar joints. Subradials a little wider than long, their lower angles curved in to form a part of the basal concavity.

The first radials much larger than the succeeding ones, heptagonal in form. Second radials nearly quadrangular, and the third hexagonal, supporting above the secondary radial plates, of which there is but one to each division of the ray.

Brachials four to five, short, widening above, the upper one with a slightly projecting angle in the middle, separating the first divisions of the arms. From two to five single wedge-formed pieces succeed the brachials, above which the arms are composed of a double series of short, interlocking pieces, each one of which gives off a moderately strong pinnule. In one of the specimens under examination, the arms on the two rays visible, continue single after the first bifurcation, making four arms to each ray, but in another

specimen apparently of the same species, a third branch is given off from the third plate above the first division, making six arms to these two rays.

From four to six interradials can be seen, the first of which is larger than the others, but owing to the crushed condition of the specimens, the exact form and number of these plates cannot be determined.

Column round, rather stout, and composed of alternately thin and thicker joints.

The specimen showing six arms to the ray, also shows a marked prominence in the central portion of the body plates, which is not seen in the other, and this we take as the type of *R. Coxanus*, and if these differences should be regarded as of specific importance the name *R. polydactylus* might be used to designate the other variety.

Position and locality: Upper part of the geode bed, one mile below Keokuk.

Nos. 197 and 223 of Mr. L. A. Cox's collection.

PLATYCRINUS MONROENSIS. N. SP.

Body small, cup-shaped, about once and a half as wide as high. Basal plates extending about one half their length beyond the first columnar joints, the lower margin projecting so as to form a narrow rim to the base. Radials wider than high, the articulating scar occupying only about one-third to one-half of their entire width.

Brachials single, narrow, subtriangular, sharply cuneate above, and supporting on their upper sides the first arm plates. On the two rays visible in the specimen, under examination, the arms, after their first division on the brachials divide again, both divisions once on the second plate above the brachials, and one of them the second time on the second arm-plate above, giving five arms to each ray.

Arms composed at first of long, rounded joints, that are somewhat zigzag, and projecting on their margins, where they give off strong pinnules, but towards their extremities they are composed of short, triangular pieces that also sustain pinnules on their longest margins. Pinnules quite stout, their diameter being about equal to one-third of the width of the plates to which they are attached.

Position and locality: St. Louis limestone, Monroe county, Ill., and Blount county, Tenn.

Illinois State collection.

ERETMOCRINUS VARSOUVIENSIS. N. SP.

Body small and turbinate below the base of the arms. Basals short, slightly projecting on their lower margins, forming a well defined rim around the base.

Primary radials three, the first comparatively large, hexagonal or heptagonal, the succeeding ones small, one quadrangular and the other subtriangular, supporting on its upper angles the secondary radial series.

Secondary radials two, the first quadrangular and the second pentangular, supporting above the two divisions of the arms, giving four arms to each ray.

The two first arm-plates are nearly quadrangular, and longer than those above. The third and fourth are nearly triangular, and are succeeded by a double series of slightly interlocking plates that spread out towards their extremities in the manner peculiar to this genus.

Interradials three, the first about twice as large as the succeeding ones. Anal series unknown.

Column at its junction with the body composed of thick, round joints, that, a short distance below, are separated by thinner ones arranged alternately.

Surface of the body plates finely granulose, with a slightly elevated ridge crossing the plates, and extending to the top of the secondary series.

This species, minus the arms, closely resembles *Batocrinus caroli* (Hall's sp.) from the same beds, but differs in the number and structure of the arms, that having but sixteen while this has twenty.

Position and locality: Warsaw beds of the St. Louis group, Warsaw, Illinois.

Illinois State collection.

ONYCHOCRINUS DISTENSUS. N. SP.

Body of medium size, composed of smooth, massive plates. Basals concealed by the column.

Subradials on the anterior side sharply angular beyond the columnar facet, forming a low, pentagonal cup.

Radials five, the first pentagonal, about one-fourth wider than long; the second, third and fourth, quadrangular, and nearly as wide as the first, their width being equal to about once and a half their length. The fifth radial is pentagonal, and supports upon its upper sloping sides the divisions of the rays. The arms, beyond the first division, throw off armlets at intervals of five or six plates to their extremities on the only rays that are preserved in the specimens obtained.

None of the specimens show more than two or three inter-radial plates. The first of these is hexagonal, about as wide as long, and this was apparently succeeded by a series of three smaller plates that are but partially preserved. Anal plates unknown.

Column round, largest at its junction with the body, and composed of very thin, even joints.

Position and locality: Chester limestone, Monroe county, Ill.

Illinois State collection.

TAXOCRINUS FLETCHERI. N. SP.

Body, with arms complete, ovate in outline, lobate, composed of thick, massive plates. Basals small, and concealed by the column.

Subradials extending nearly half their length beyond the columnar facet, forming by themselves a low, pentagonal cup. Primary radials three in each ray, gradually widening from the first to the third which is an axillary plate, giving support to the first plates of the second series. Secondary radials three, more than half as wide as the first, the last one supporting the first plates in the tertiary series. Above the secondary series some of the arms, if not all, divide again on the fifth plate, above which they become quite slender.

On the anal side of the specimen two series of plates are preserved. The first one is hexagonal in form, and rests between the upper angles of two of the subradials. In the next series there are three plates, each about half as large as the first, the middle one resting directly upon it, and the others resting between the upper angles of the first anals and the adjacent first radials. Above this second row of anal plates another series is only partly visible. Interradials, one or more to each space, but their form and number can not be clearly determined from the specimen in hand.

Column round, larger at its junction with the body than below, and composed at first of thin, even joints, but below thicker plates are intercalated at irregular intervals.

Position and locality: Kinderhook group of the lower carboniferous series, Marshalltown, Iowa.

Dedicated to Mr. Thos. Fletcher, of Keokuk, Iowa, to whom I am indebted for this and other interesting fossils.

The author's collection.

CYATHOCRINUS HAMILTONENSIS. N. SP.

Body of medium size, basin-shaped, base deeply impressed, width of body about twice as great as the height to the top of the first radial series. Basals small and concealed in the basal concavity by the upper joints of the column.

Subradials hexagonal, counting three angles on the under side, and curve into the basal concavity; width and length nearly equal; slightly convex, the greatest convexity being a little below the center of the plate.

Radials about twice as wide as long, those on the anterior side pentagonal, the articulating facet for the reception of the brachials occupying about one-half the width of the plate. In the anterior ray the first bifurcation takes place on the fourth brachial, and in one of the antero-lateral rays on the third, and a second bifurcation on each division of this ray takes place on the third plate above the first. The arms diminish rapidly in size beyond the first bifurcation. Anal side unknown.

Column rather slender, and composed of short, round, even joints.

This form has been referred to a species described by Hall (Bost. Jour. of Nat. Hist., Vol. 7, No. 2, page 294,) under the name of *C. parvibrachiatus;* but according to the description given of that species, it had no radial plates at all, the arms being articulated to the subradials, which would, if true, remove it entirely from the

Cyathocrinidæ. If this was the form he had in hand when his description was written, it can hardly hold the species in the absence of any figure or diagram to show the error in its diagnosis.

Position and locality: Upper beds of Keokuk limestone, Hamilton, Ill.

No. 174 of Mr. L. A. Cox's collection.

CYATHOCRINUS? MARSHALLENSIS. N. SP.

The crinoid for which the above specific name is proposed, I have been unable to assign with certainty to any known genus.

Its general aspect is that of a *Poteriocrinus*, but it differs so essentially from that in its diagnosis, that I have placed it among the *Cyathocrinidæ*, where it seems to belong.

Diagnosis: Body mamillate, length and breadth about equal, and truncated at the base where it joins the column. Basal plates small, longest on the anterior side, angular above, and forming by themselves a shallow pentagonal cup. Subradials about as high as wide, four of them of equal size and hexagonal, the fifth on the anterior side nearly twice as large as the others and heptagonal. The radials on four of the rays are about the same size as the smallest subradials, pentagonal in form, their lower angles fitting into depressions between the subradials, constricted from the lower lateral angles upward, so that the upper margins, which support the brachials, are only about half as wide as the greatest width below.

Brachials three on these four rays, narrower than the radials, two of them quadrangular, and the third angular above, supporting the first divisions of the arms. The lateral spaces between the brachials, and extending below to the middle of the radials, appears to have been filled by a calcareous integument, or with minute plates that are too small to present definite forms under an ordinary glass.

On the anterior side of the specimen, the large anterior subradial is succeeded by a quadrangular radial resting directly upon its truncated upper margin, and this is succeeded by two or more quadrangular brachials, beyond which its structure cannot be made out.

The arms after the first bifurcation on the third brachial, divide again on the sixth or seventh plate, and some of the branches once or twice more, higher up. They are composed of rather long, rounded quadrangular joints, decreasing gradually in size to their extremities. Anal plates unknown.

Column round, very strong at the base of the calyx, decreasing about one-half in diameter a half inch below, and composed of rather thin, even joints.

Position and locality: Kinderhook group, Marshalltown, Iowa.

The author's collection.

EUPACHYCRINUS ASPERATUS. N. SP.

Body of medium size, basin-shaped, composed of very massive angular plates. Base deeply concave and basals concealed by the column.

Subradials very massive, projecting outward and downward, slightly excavated below from their outer sides to the point where they join the basals, and forming five prominent angular nodes on which the body would rest when divested of its column.

Radials nearly twice as wide as long, four of them pentagonal, the right posterior one quadrangular, and all produced into obtuse nodes or ridges that on three of them extend nearly across the plate, nearer to the lower than the upper margin, leaving a broad, sloping surface between the ridges and the upper margin of the radial plates.

Brachials one each of the anterior and the antero-lateral rays, shorter and about the same width as the radials, and like them produced into a distinct ridge on their upper margins.

The right posterior brachial supports two shorter brachials, and these support above two arms each, making four arms to this ray. The left posterior brachial supports an additional brachial on one side, that gives support to two arms, while a single arm is supported on the other side, making three arms to this ray. The other brachials give support to two arms each, making thirteen altogether for this species. The first three or four plates of each arm are quadrangular, but they soon pass into a series of wedge-formed interlocking pieces, gradually becoming narrower toward their extremities.

Three anal plates are visible, the first is pentagonal, larger than both the others, nodose like the subradials between which it rests, while its upper angle extends a little above the radial on the right. The second anal rests upon the upper truncated margin of the left posterior subradial, and the third between the first and second anals.

Column round and rather small for the size of the body.

This species is related to Lyons' *E. quator-decimbrachialis*, but differs in its less massive form, and in the number of its arms.

Position and locality: Chester limestone, Monroe county, Ill.

Illinois State collection.

EUPACHYCRINUS MONROENSIS. N. SP.

Body of medium size, low, basin-shaped, composed of massive plates.

Basals small, triangular above and below, the inner angles bent downward under the column, and the outer ones bent slightly upward between the subradials.

Subradials protuberant, sub-hemispheric externally, generally pentangular, the one on the anal side a little larger than the others, and truncated on its upper margin for the support of the anal plate.

Radials pentagonal, about twice as wide as long, and truncated entirely across their upper margins for the reception of the radial series.

Anals one, quadrangular, length and width about equal, extending above to a level with the summit of the adjacent radials, and resting below on the truncated upper margin of the right posterior subradial.

Arms and column unknown.

This species is related to *Eupach. formosus*, Geol. Surv. Ill., Vol. 5, page 549, but differs from that in the proportions of its radial plates and the subglobose character of its subradials.

Position and locality: Chester limestone, Monroe county, Ill.

Illinois State collection.

DICHOCRINUS HAMILTONENSIS. N. SP.

Body small, length and breadth apparently about equal, though from the crushed condition of the body plates, the exact proportions of the body can not be accurately determined. Basals about half as long as the radials, forming by themselves a low, shallow cup.

Radials quadrangular, nearly once and a half as long as wide, with a narrow, articulating scar at the summit for the reception of the brachial series.

Brachials three, the last one longer than those below, and supporting on its upper sloping sides the first arm plates.

Arms two to each ray, as far as can be seen in the specimen before me, composed of short, wedge-shaped pieces, rounded exteriorly, and giving off from their longest sides rather strong pinnules.

Column unknown.

This species is nearly related to *D. ficus*, of Lyon & Casseday, but differs from that in the shorter form of the body, and in the number of its brachial pieces, which in their species is only two to each ray.

Position and locality: Upper part of the Keokuk limestone, Hamilton, Ill.

No. 267 of Mr. L. A. Cox's collection.

DICHOCRINUS COXANUS. N. SP.

Body small, ovate in outline, pointed at the base and contracted at the summit of the radial series, so that its greatest diameter is near the base of the radial plates.

Basal plates nearly three-fourths as long as the radials, forming by themselves a rather deep cup.

Radials longer than wide, lateral borders nearly straight, slightly contracted at their summits, the articulating scar for the reception of the brachial series occupying about one-third of the width of their upper margins.

Brachial plates small, apparently two in number, the second one being the longest, and supporting on its upper sloping sides the first arm plates.

Arms two to each ray, composed of short, rounded joints, which give off strong pinnules from their inner borders. Anal side and

column unknown. The surfaces of the body plates are marked by obscure longitudinal ridges that will serve to distinguish the species from any one hitherto described from this horizon.

Position and locality: Upper part of the Keokuk limestone, Hamilton, Ill.

No. 14 of Mr. L. A. Cox's collection.

TALAROCRINUS OVATUS. N. SP.

Body above the medium size, ovate in general outline, lobate as viewed from above or below.

Basals about half as high as wide, impressed below, and pentagonal above, with a slight depression at their lateral borders.

First radials about one-third longer than wide, the anterior one pentangular, the others quadrangular, and all protuberant. The succeeding radials not visible.

The first anal is as large or a little larger than the first radials, heptagonal, having four distinct angles above and three below. It is succeeded by three small anals, the central one of which is pentagonal, and rests on the truncated summit of the first anal, while the other two, the form of which can not be clearly seen, rest upon its upper lateral angles. Above this there is one or two series of very small plates surrounding the anal opening.

The vault is composed of very small, smooth plates, except the central one, which is larger, and produced into a pointed spine. In one of our specimens there is a spine-bearing plate, between the arm openings and the central spine on two of the rays. Arm openings two to each ray. Arms and column unknown.

This species is related to *T. sexlobatus*, (Shumard's sp.) but differs from that in its more symmetrical form, its less protuberant radial and anal plates, and less nodose summit.

Position and locality: Chester limestone, Monroe county, Ill.

Illinois State collection.

AGASSIZOCRINUS PAPILLATUS. N. SP.

Body rather below the medium size, subovate, width at the summit of the radials a little more than the length, composed of massive, slightly rounded plates that are separated by well-defined and deep sutures.

Basals pentagonal, about as wide as long, and rounded below, where their inner margins form the walls of a very small pentapetalous opening for the attachment of a very delicate round column, two or three joints of which remain attached to one of our specimens.

Subradials three hexagonal, counting three angles below, and two on the posterior side heptagonal, length and breadth about equal.

Radials pentangular, nearly twice as wide as long except the two posterior ones which are rather narrower than the others.

Brachials about the same size and form as the radials, and support an their upper sloping sides the first arm plates. Arms two to each ray, composed of quadrangular joints that gradually diminish in width to their extremities.

Anals, three visible; the first is nearly as large as the radial plates, pentagonal and situated as in *Poteriocrinus*, between two of the subradials, and partly under the left side of the right posterior radial. The second is about half as large as the first, and rests on the upper truncated margin of the left posterior subradial. The third is very small, and rests upon the upper angle of the first anal.

Position and locality: Chester limestone, Monroe county, Ill.

Illinois State collection.

AGASSIZOCRINUS HEMISPHERICUS. N. SP.

Body small, bowl-shaped or hemispherical in outline, about once and a half as wide as high to the summit of the radial series, rounded at the base, and composed of massive protuberant plates.

Basals small, projecting but slightly below the subradials, forming a little pentagonal star. No columnar facet is visible.

Subradials a little longer than wide, strongly protuberant, three of them pentagonal, and two on the posterior side hexagonal.

Radials pentagonal, three of them rather more than once and a half as wide as long, the two on the posterior side rather narrower than the others, and all truncated squarely across their summits for the reception of the brachials. Sutures between all the plates of the body distinct.

Brachials as wide below as the radials, but strongly constricted and sharply angular above, where they give support to the two divisions of the rays. The arm plates attached are three in number, the first nearly twice as long as the succeeding ones, and all quadrangular in form.

Four anal plates are visible, the first is protuberant, pentangular, about half as large as the largest radials, and rests squarely upon the truncated upper margin of the right posterior subradial, and under the left side of the right posterior radial.

The second anal is about half as large as the first, longer than wide, and rests on the upper margin of the left subradial. The other anals are smaller, the third rests between the first and second, and the fourth on the summit of the second.

Column unknown.

Position and locality: Chester limestone, Randolph county, Ill.

Illinois State collection.

LECYTHIOCRINUS ADAMSI. N. SP.

Body of medium size, irregularly subovoid, slightly pentalobate, as seen from above or below, from the protuberance of the radial plates, and composed of smooth and rather thin plates. The base is convex, and occupies about one-fourth the entire length of the body.

Subradials a little longer than wide, with an angular prominence just above the middle of each plate, extending from the center to the upper margins.

Radials about half as large as the subradials, length and width about equal, triangular below, the angles fitting into the depressions between the subradials. They are all surmounted by a small semi-circular arm facet, from which a shallow groove extends to a central opening in the summit.

Just above the summit of one of the subradials, and in the lateral angles of two of the radial plates, there appears to have been a circular opening rather larger than the arm facets, which is now filled with stony matter, and whether this is an anal opening, or an accidental break in the test of the body, is a question to be determined from additional material. Columnar facet scarcely larger than that for the reception of the arms.

Arms and column unknown.

We take pleasure in dedicating this unique fossil to Mr. W. H. Adams, of Elmore, Peoria county, who found it on section 13, township 11 north, range 6 east, in Peoria county.

It is from about the horizon of coal No. 8 of the lower Coal Measures.

ARTICLE II.

CORRECTIONS AND PROPOSED NEW NAMES FOR SPECIES DESCRIBED IN THE GEOLOGICAL REPORTS OF ILLINOIS, UNDER NAMES THAT WERE PREOCCUPIED; AND DESCRIPTIONS OF TWO NEW SPECIES OF FOSSIL SHELLS FROM THE COAL MEASURES OF ILLINOIS AND KANSAS.

BY A. H. WORTHEN.

The following species of fossil shells were described by Meek and Worthen in the published volumes of the Geological Survey of Illinois, under names that were subsequently found to be pre-occupied by other authors; and the following corrections are now proposed for these forms:

Modiolopsis orthonota, M. and W., 1868, Geol. Surv. of Ill., Vol. 3. The name proposed is *Modiolopsis rectaformis*.

Modiolopsis subnasuta, M and W., 1870, Geol. Surv. of Ill., Vol. 3. Name now proposed, *Modiolopsis Carrollensis*.

Orthoceras annulo-costatum, M. and W., 1862, Geol. Surv. of Ill., Vol. 6. Name now proposed, *Orthoceras Randolphensis*.

Platyceras subundatum, M. and W., 1866, Geol. Surv. of Ill., Vol. 3. Name now proposed, *Platyceras subsinuosa*.

Pleurotomaria conoideus, M. and W., 1866, Geol. Surv., of Ill., Vol. 5. Name now proposed, *Pleurotomaria conoformis*.

Platyostoma tumida, M. and W., 1860, Geol. Surv. of Ill., Vol. 2. Name now proposed, *Platyostoma Grayvillensis*.

A shell, figured and described in Vol. 3, Geol. Surv. of Ill., page 536, pl. 19, fig. 1, 2, belonging to the genus *Lithophaga*, was referred

doubtfully to Phillip's species, *M. lingualis* from the carboniferous limestone of Yorkshire, G. B. Having become satisfied that it is specifically distinct from Phillip's species, I now propose for it the name of *Lithophaga Illinoiensis.*

CAMEROPHORIA GIFFORDI. N. SP.

Shell above the medium size, broadly ovate or sub-circular in general outline. Dorsal valve nearly circular, moderately convex, the greatest convexity being about one-third the distance from the beak to the front part of the shell, umbo depressed. Ventral valve much more convex, and the beak produced beyond that of the dorsal valve, and strongly recurved.

The only specimen we have seen of this fine shell is an internal cast, with a fragment of the test adhering to the beaks. Traces of ten or twelve broad, shallow plications can be seen on the front portion of the shell, two or three of which probably extended to the beak on the ventral valve, while the others became obsolete before reaching the cardinal border. Traces of fine longitudinal striations are also visible with a good glass. Length from the beak to the front 23, breadth 22, height 14 millimeters.

Dedicated to the memory of Mr. Wm. Gifford, of Peoria county, Ill., from whom the specimen was received.

Position and locality. Middle coal measures near Alta, Peoria county, Ill.

Illinois State collection.

CHÆNOMYA MARIA. N. SP.

Shell elongate, sub-cylindrical, anterior side much compressed and aperture entirely closed; posterior side truncated and widely gaping. Base slightly convex in outline, rounding up gradually in front and abruptly behind, dorsal side a little concave from the beaks to the posterior extremity. Beaks depressed, incurved, and located about one-fifth the entire length of the shell from the anterior side.

Two conspicuous furrows commence at the beak, the anterior one crossing the valve obliquely to the base of the shell at a point about two-fifths of its entire length from the anterior side; the posterior one crossing the shell much more obliquely, and terminating at the base of the shell, near its posterior extremity.

In addition to these furrows each valve is marked by about thirty-two longitudinal ridges that are a little wider than the spaces between them. These commence at the dorsal margin near the beak, and when they cross the posterior furrow already described, they are deflected abruptly forward to a right angle with their former course, about two out of every three ending at the anterior furrow, while the others are continuous across that to the anterior border of the shell.

A small fragment of the shell, attached to the cast, shows that the surface was finely striated obliquely from the beak to the front,

and with a good lens the striæ are seen to consist of rows of minute granules.

Dedicated to Mrs. Orestes St. John, by whom this fine specimen was discovered, and to whom I am indebted for the use of it.

Position and locality: Upper coal measures, Shawnee county, Kansas.

ARTICLE III.

DESCRIPTIONS OF TWO NEW SPECIES OF CRINOIDEA FROM THE CHESTER LIMESTONE AND COAL MEASURES OF ILLINOIS.

BY CHARLES WACHSMUTH.

ALLAGECRINUS CARPENTERI. N. SP.

The unique specimen upon which this species is founded is from the collection of Prof. Worthen, who kindly permitted me to describe it. It is partly imbedded in the rock, but only a small portion is covered by the matrix. It consists of a two-inch column, the calyx and arms. The calyx is somewhat pressed out of shape, but with this exception is excellently preserved. The specimen is small, its length measuring from the basal disk to the tips of the arms, 80.100 parts of an inch, to the arm bases, 16.100 parts, of which the basal disk occupies only 4.100 parts.

Specific Diagnosis: The calyx is of small size, the form is cylindro-conical; it is composed of two rings of plates, the upper supporting the arms. There are no inter-radials, and no azygous side. Plates strong, without ornamentation.

Basal disk undivided, at least without visible suture lines; it is short, three times wider than high, saucer-shaped,—the upper side but little wider than the bottom part, with very obtuse upper angles.

Radials 1x5, differing somewhat in width,—wider at the top,—their length one-half to three quarters greater than their width, quadrangular in outline, but actually pentangular; axillary, with very obtuse upper angles, the sloping sides slightly excavated and supporting the free arms.

Arms two from each ray, simple throughout, unequal in size,—some of them one-half thicker than others,—not tapering; nearly as thick at the distal end as at the base. The arms are constructed of from eight to ten simple joints, the first joint one-half higher than wide, and differing from the others by being flattened at the dorsal side, all succeeding ones rounded at the outer side, with slightly expanded ends; upper and lower sides almost parallel. The length of the joints is somewhat irregular, varying from three to four times their width, but in proportion to the width of the arm; ventral groove wide and deep. No pinnules have been observed, and the construction of the vault is unknown.

Column circular, very strong at the basal disk, but tapering so rapidly in its course downward that at about one-fourth of an inch

it is reduced to less than one-third its greatest width, whence it remains stationary as far as it is preserved in the specimen. The segments of the upper or conical part are short, sharply-edged, and of the same height, but as soon as the column attains its ordinary size, the joints become abruptly higher, more cylindrical, and thicker and thinner joints alternate in the usual way. Central perforation small.

The specific name is given in honor of P. Herbert Carpenter, Assistant Master at Eaton college, England, one of the founders of the genus *Allagecrinus**

Geological position, etc.: From the Chester or Kaskaskia limestone, Monroe county, Ill.

Illinois State collection.

ACROCRINUS WORTHENI. N. SP.

This species is described from a single specimen, of which only the calyx is preserved, the vault, the arms, and the column are so far unknown. The calyx, however, is in excellent preservation, and, notwithstanding its small size, exposes plainly every plate. The form is calyculate, broadly truncate at the bottom, abruptly bending upward toward the base of the first radials, whence it gradually decreases in width to the arms. Its length is 40.100 of an inch, its greatest width 42.100, the width at the arm-bases 34.100. The plates are plain, without ornamentation, but sufficiently convex to point out the sutures.

The genus *Acrocrinus* departs from most Palæocrinoidea in two important points. The plates of the calyx, which in all species with a large number of plates decrease in size from the basals to the top of the calyx, in *Acrocrinus* decidedly increase in the same direction. Another striking departure is that the radials are not connected with the basals, and partly not even among each other, but are separated by several rings of plates, which in their position are partly radial, partly inter-radial, and which have apparently no representation in other genera of the Palæocrinoidea†

The specimen under consideration is composed of 86 plates, some of them extremely minute. There are two comparatively large basals, equal in size, the suture passing from the anterior to the posterior side, which together form a concavity within the truncate part of the calyx. The basal disk is surrounded by a ring of twelve very small triangular pieces, and these in turn are succeeded by a second

* The genus was proposed by P. Herb. Carpenter and Dr. R. Etheridge, jun., for a small species from the Carboniferous of Scotland. [Annals and Magazine Nat. hist., April 1881, p. 281.

† They may have in some genera a representation in the vault, in which to some extent the plates of the calyx are repeated. Here the representatives of basals and radials are frequently separated by one or more rings of intercalated pieces. These vault pieces increase in number by age, and are often entirely absent in young specimens or in small species of the genus, being here evidently a product of growth. In *Acrocrinus*, one of the latest genera of the Palæocrinoidea, the intercalated plates in the calyx may have a similar origin, but are here evidently not mere individual growth, but have become a fixed character.

ring of twelve considerably larger plates, which, with their lower sloping sides, are placed between the triangular pieces, the point of the angle touching the basal disk. Ten of these plates are hexagonal, two heptagonal, the former angular at the outer side, the other two truncate. One of the latter is directed anteriorly, and supports upon its upper truncate side the first radial of that side, the other posteriorly, and is succeeded by a row of special anal plates, which will be described presently. The plates are of nearly equal size, higher than wide, connected laterally, and forming a continuous ring, which in the specimen lies at the edge of the truncate, somewhat rounded portion of the calyx.

The succeeding plates consist of six sections, and are radials, interradials or anal plates. There are five rows of radials, separated by four inter-radial series of from six to seven pieces. Two other series of seven plates each, arranged like the former, occupy the azygous side, and are separated, in place by radials, by a row of four hexagonal special anal plates, which, with the exception that the upper side of the upper plate is not excavated, have exactly the form and size of the four radial plates at the anterior ray. This ray has exceptionally four radials, hexagonal like the anals, which with their truncate side are connected among each other, and with the heptagonal piece of the second ring heretofore described. The four lateral rays not only consist of but three plates, but these radials have also a very different form, and are partly disconnected. The first is hexagonal with upper and lower side angular, the second pentangular, angular below. Only in a single ray of the specimen do the angles of the two plates touch each other, in the four others they are separated by plates from different inter-radial areas which join here, their suture forming a line between the angles of the two radials. The first and second radials are all connected by a truncate side. The third radials are one-half wider than high, hexagonal, contrary to the first and second, which are a little higher.

The inter-radials of the four lateral rays, toward the anterior side, consist of seven plates in four series, 2, 2, 2, 1; at the anterior side of only six pieces, 2, 1, 2, 1. The plates of the first series rest with their lower sloping sides against two of the intercalated pieces—those composing the second ring around the basals; they are placed with their lateral side against the sides of their fellows of the adjoining inter-radial area, except toward the anterior and posterior side, where they abut, at the former against the first radial, at the latter against one of the special anal plates. The plates of the succeeding series rest with their outer sides within the angle between two radials, with the other side against the adjoining inter-radials. The plates of the inter-radial areas are either hexagonal or pentagonal, and their increase in size in an upward direction is even greater in that same direction among the radials, the upper one being fully three times larger than the two inter-radials of the first series. The same is true with regard to the azygous side.

The anal side is very wide, and is composed of a median row of four hexagonal pieces, longitudinally arranged, and of a series of

seven plates at each side of it. The latter are arranged like the seven plates of the two inter-radial areas adjoining the anterior ray, and as the radials of that side, as already stated, are arranged and constructed like the special anal plates, the anterior side with its two inter-radial series is almost a perfect counterpart of the anal area. The uppermost anal plate is hexagonal or, perhaps, octagonal, its upper side truncate; its size is equal to, if not larger than, that of the first radials.

Acrocrinus Wortheni differs from the two previously described species of this genus most conspicuously in the form of the basal plates. The construction of the other plates is so imperfectly known, that a comparison of other parts is impossible.* There is also a great difference in the form of the body.

The specific name is given in honor of Prof. A. H. Worthen, the able Director of the Illinois Geological Survey.

Geological position, etc: From the coal measures of Peoria county, Ill.

The type is in the collection of Prof. Worthen.

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* The third part of the Revision of the Palæocrinoidea, by Wachsmuth and Springer, will give a carefully revised generic description of Acrocrinus, and accurate diagrams. The latter will be published also with this description in the 7th volume of the Illinois Report.